

We claim:

1. A filter element comprising:
 - (a) a porous membrane comprising ceramic particles and contiguous metallic particles, wherein said ceramic particles are present at a ratio of between greater than 0 volume percent and less than or equal to 50 volume percent, wherein said metallic particles are sintered and form a metallic matrix and said ceramic particles are contained within said metallic matrix; and
 - (b) a single layer of a porous support having an upper surface and a lower surface for supporting said membrane, wherein said metal particles are sintered to said upper surface of said support and do not substantially penetrate the pores of said support.
2. The filter element of claim 1, wherein said porous support is selected from the group consisting of wire mesh stainless steel screens, sintered metals, sintered ceramics, sintered metal fiber meshes, sintered random metal fiber meshes, ceramic fiber meshes, electroformed screens, photoetched screens and plasma etched screens.
3. The filter element of claim 1, wherein said porous support is comprised of a metal selected from the group consisting of titanium, iron, nickel, chromium, silver, and alloys thereof.
4. The filter element of claim 1, wherein said metallic particles are comprised of a metal selected from the group consisting of titanium, iron, nickel, chromium, silver and alloys thereof.
5. The filter element of claim 1, wherein said metallic particles comprise stainless steel.
6. The filter element of claim 1, wherein said ceramic particles are comprised of an oxide.
7. The filter element of claim 6, wherein said oxide is selected from the group consisting of alumina (Al_2O_3), magnesia (MgO), titania (TiO_2), silica (SiO_2), zirconia (ZrO_2), yttria (Y_2O_3), magnesium aluminate (MgAl_2O_4), and nickel aluminate (NiAl_2O_4).
8. The filter element of claim 1, wherein said ceramic particles are comprised of a nitride.
9. The filter element of claim 8, wherein said nitride is selected from the group consisting of aluminum nitride (AlN), silicon nitride (Si_3N_4), and sialons (SiAlON).
10. The filter element of claim 1, wherein said ceramic particles are comprised of a carbide.
11. The filter element of claim 10, wherein said carbide is silicon carbide.

12. The filter element of claim 1, wherein said ceramic particles are comprised of a boride.
13. The filter element of claim 12, wherein said boride is titanium boride (TiB₂).
14. The filter element of claim 1, wherein said porous support is a wire mesh having an approximate weave count selected from the group consisting of 325 x 2300, 510 x 3600, and 165 x 1400.
15. The filter element of claim 1, wherein said metallic particles have a uniform particle size ranging from about 0.005 to 10 μm.
16. The filter element of claim 15, wherein said metallic particles have a uniform particle size ranging from about 1 μm to 10 μm.
17. The filter element of claim 1, wherein said metallic particles consist essentially of the same material as said porous support.
18. The filter element of claim 1, further comprising a second porous layer bonded to the lower surface of said porous support, wherein said second layer protects said porous support from possible deformation under high pressure.
19. The filter element of claim 18, wherein the pore size of said second layer is greater than the pore size of said porous support.
20. The filter element of claim 18, wherein said second porous layer is selected from the group consisting of wire mesh stainless steel screens, sintered metals, sintered ceramics, sintered metal fiber meshes, sintered random metal fiber meshes, ceramic fiber meshes, electroformed screens, photoetched screens and plasma etched screens.
21. The filter element of claim 19, wherein said second porous layer is a wire mesh selected from the group consisting of Single Plain Dutch Weave, twill, double twill, and reverse weave.
22. The filter element of claim 18, further comprising a third porous layer bonded to said second layer.
23. The filter element of claim 22, wherein the pore size of said third porous layer is greater than the pore size of said second layer.
24. The filter element of claim 22, wherein said third porous layer is selected from the group consisting of wire mesh stainless steel screens, sintered metals, sintered ceramics, sintered metal fiber meshes, sintered random metal fiber meshes, ceramic fiber meshes, electroformed screens, photoetched screens and plasma etched screens.

25. A filter element comprising:
 - (a) a membrane comprising contiguous sintered metal particles having uniform diameters; and
 - b) a single layer of a porous support having an upper surface and a lower surface for supporting said membrane, wherein said metal particles are sintered to said upper surface of said support and do not substantially penetrate the pores of said metal support.
26. The filter element of claim 25, wherein said porous support is selected from the group consisting of wire mesh stainless steel screens, sintered metals, sintered ceramics, sintered metal fiber meshes, sintered random metal fiber meshes, ceramic fiber meshes, electroformed screens, photoetched screens and plasma etched screens.
27. The filter element of claim 25, wherein said porous support is comprised of a metal selected from the group consisting of titanium, iron, nickel, chromium, silver, and alloys thereof.
28. The filter element of claim 25, wherein said metallic particles are comprised of a metal selected from the group consisting of titanium, iron, nickel, chromium, silver and alloys thereof.
29. The filter element of claim 25, wherein said metallic particles comprise stainless steel.
30. The filter element of claim 25, wherein said porous support has an approximate weave count selected from the group consisting of 325 x 2300, 510 x 3600, and 165 x 1400.
31. The filter element of claim 25, wherein said metallic particles have a uniform particle size ranging from about 0.005 μm to 10 μm .
32. The filter element of claim 31, wherein said metallic particles have a uniform particle size ranging from about 1 μm to 10 μm .
33. The filter element of claim 25, wherein said metallic particles consist essentially of the same material as said porous support.
34. The filter element of claim 25, further comprising a second porous layer bonded to the lower surface of said porous support, wherein said second layer protects said porous support from possible deformation under high pressure.
35. The filter element of claim 34, wherein the pore size of said second layer is greater than the pore size of said porous support.
36. The filter element of claim 34, wherein said second porous layer is selected from the group consisting of wire mesh stainless steel screens, sintered metals, sintered

ceramics, sintered metal fiber meshes, sintered random metal fiber meshes, ceramic fiber meshes, electroformed screens, photoetched screens and plasma etched screens.

37. The filter element of claim 36, wherein said second porous layer is a wire mesh selected from the group consisting of Single Plain Dutch Weave, twill, double twill, and reverse weave.
38. The filter element of claim 34, further comprising a third porous layer bonded to said second layer.
39. The filter element of claim 38, wherein the pore size of said third porous layer is greater than the pore size of said second layer.
40. The filter element of claim 38, wherein said third porous layer is selected from the group consisting of wire mesh stainless steel screens, sintered metals, sintered ceramics, sintered metal fiber meshes, sintered random metal fiber meshes, ceramic fiber meshes, electroformed screens, photoetched screens and plasma etched screens.